

Research Note 83-10

ORGANIZATIONAL STRUCTURE AND LEADERSHIP FACTORS
AS DETERMINANTS OF SMALL GROUP PERFORMANCE AND
TEAM COHESIVENESS

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BASIC RESEARCH



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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The creation and maintenance of functional group units is related to the benefits that group members receive through their cooperation and participation in the group effort. An important determiner of group participation and individual performance within a group is the method of distribution of rewards and/or resources among group members. Based upon the assumption of the overriding importance of an individual's immediate self-interest, the dominant theoretical formulation proposed to account for the "distributive problem" is		

equity theory, according to which outcomes (rewards) are allocated to persons according to their relative input. Recent research, however, has demonstrated that at least one other important norm of distributive justice appears to operate as a contrasting solution to the distributive problem. This position, described as equality theory, provides for distributing rewards among group members equally and without regard to relative inputs and emphasizes that a person's self-interests, especially over the long-term, are better served by an allocation of rewards that benefit both him/herself and others.

Previous research findings showed that individuals in the small group environment, although placed in close proximity and required to share in some of the available environmental resources, will nonetheless tend to function independently and prefer an equitable allocation of rewards. This tendency toward isolation (i.e., minimal socialization and communication) is all the more striking when under some circumstances it resulted in prolonged work days and self-imposed limits on earnings. Therefore, the most recent series of experiments focused upon conditions which promote group organizations utilizing equal reward allocation, and the social effects of such group formation.

The experimental procedure involved subjects performing on two work tasks: a manual work task (MT) which was available in each subject's private chamber, and the Alluisi Performance Battery (AP) which was available only in the work room. The methodology used to determine a participant's preference for equity versus equality in reward allocation was a choice paradigm in which subjects indicated their selection prior to each of several work episodes which occurred daily.

Our investigations into the relationships between reward allocation and group processes has revealed that:

1) Both men and women are responsive to incentives for group participation employing the equal distribution of rewards with women showing a greater sensitivity toward this allocation form.

(2) Once formed, groups tend to show cohesiveness and resistance to reverting back to individual modes of operating even when allocation parameters which were initially insufficient to generate group formation are reinstated. This "inertia" principle in group formation is important since it suggests that initial investments in promoting group formation will not only be effective, but will have long-term beneficial residuals in that group members will tolerate the subsequent reduction of "seeding" incentives.

(3) Shifts to group modes of performance and reward allocation are accompanied by increased socialization, interpersonal communications, and morale as compared to these social expressions during individual performance conditions. These concomitant changes support the interpretation that this group formation process is "authentic" and results in cohesive group unit.

A team task, recently introduced, required the coordinated input of all three group members for the solution of the "dials problem" component of the Alluisi Performance Battery. Under team task conditions, a selection of the group mode of work organization required the participants' choice of both equal reward allocation as well as tripartite cooperation among team members during group work episodes. The results of this team performance experiment both confirmed and extended the previous findings of this thematic research program. Specifically, the transition to group (team) structure can be achieved through incentive "seeding" operations when this group mode involves both equal sharing of rewards, as well as cooperation between participants for the effective execution of a team task. Further, analysis of component problems of the team performance on the Alluisi battery revealed the systematic use of specialized assignments for each participant to the various components of the Alluisi battery. Work report surveys revealed that this distribution of assignments occurred through mutual tripartite agreement and without the internal recognition of any individual as the team leader.

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BACKGROUND

Where sustained and accurate performance on a complex duty assignment for days, weeks, or longer is critical to the successful outcome of a given team mission, it is obviously essential to know how best to arrange individual and/or group living and work routines to promote maximum team performance effectiveness and maintain high team cohesiveness throughout the mission's duration. It is thus necessary to know the most effective organizational structure for such team units and to understand the interacting motivational factors which in concert determine both team performance and cohesiveness over extended intervals and the day-to-day status of the group as a social system.

The research focused upon an experimental analysis of the interacting organizational and motivational factors which influence performance effectiveness and cohesiveness in small operational groups or teams. Studies were conducted with groups of male and female volunteers during continuous residence for extended periods (i.e., days to weeks) in a programmed laboratory environment providing work and recreational opportunities within the context of a biologically and behaviorally supportive naturalistic setting.

The creation and maintenance of functional group units is related to the benefits that group members receive through their cooperation and participation in the group effort. An important determiner of group participation and individual performance within a group is the method of distribution of rewards and/or resources among group members. Based upon the assumption of the overriding importance of an individual's immediate self-interest, the dominant theoretical formulation proposed to account for

the "distributive problem" (Sampson, 1975) is equity theory, according to which outcomes (rewards) are allocated to persons according to their relative input (Adams, 1965). Recent research, however, has demonstrated that at least one other important norm of distributive justice appears to operate as a contrasting solution to the distributive problem. This position, described as equality theory, provides for distributing rewards among group members equally and without regard to relative inputs and emphasizes that a person's self-interests, especially over the long term, are better served by an allocation of rewards that benefit both him/herself and others (Deutsch, 1975). Equality emerges as an allocation norm when group members attempt to maintain equal status and partnership, and when motivation is directed toward group harmony and solidarity.

Deutsch (1975) has pointed out that equity is often the norm of a social exchange within a group effort for which high productivity is the major goal and competition is encouraged. On the other hand, equality tends to predominate in group situations which foster high interpersonal relationships and future interactions (e.g., the family unit) and in which helping others, and sharing have achieved high social value. Clearly, in an organizational setting such as the U.S. Army both types of groups and groups values exist for different specific purposes. Application of equity or equality as distributive norms in establishing group units must take into account differences in outcome goals as well as other variables which have been shown to be related to the choice of reward allocation norms. Importantly, in this regard, it has been demonstrated that males and females differ in their strategies for dealing with distributive problems, with males tending to favor equitable distributions whereas females under similar conditions choose equality as the norm for allocating rewards among

group members. Kahn, O'Leary, Krulemitz, and Lamm (1980) have summarized the research in this area relating to sex differences, and have attributed these differences to the "differential socialization of males and females in contemporary western society such that equity is more consistent with the achievement goals of men and equality is more consistent with goals of women". These recognized differences, as well as the conditions which modulate the extent of divergent allocation outcomes, are immediately relevant to the concerns of the armed services wherein the increasing utilization of female personnel creates the need to examine the most efficient deployment of women into operational units of same and mixed gender composition.

For the most part, the paradigms used in reward allocation research have focused upon four classes of variables which were usually investigated in short term experimental situations. These four variables are: 1) the extent of the subjects self-interest in the outcome of reward distribution, 2) the degree of control the subjects have in the distribution of rewards, 3) the amount of actual and anticipated interaction or interpersonal contact between group members, and 4) the sex of allocator and recipient. The purposes of the present series of experiments was to examine the performances and interactions of 3-person male and female groups living for prolonged periods in a residential environment in relation to the allocation systems available for reward distribution. The methodology employed in this research differs considerably from that traditionally employed and offers several advantages not found in conventional research protocols. Chief among these is the use of a continuously programmed small group environment in which the social and work performances of group participants are evaluated systematically over several days rather than as

single outcome measures taken at the conclusion of a brief episodic experimental situation.

Summary of Previous Research

The methodology initially used to determine a subject's preference for equity versus equality in reward allocation has been a choice paradigm in which participants make their selection on the basis of the time interval during which they performed work. In an hourly choice paradigm, selected hours of the day were designated "group" hours and monetary earnings for task performance during these hours were combined and allocated in equal shares regardless of an individual's contribution to the group total. Other hours during the day were designated as "individual" and during these hours subjects received rewards in direct proportion to their work performance and independently of the performance of other group members. Under these conditions, a strong preference for the equity (individual) work condition has been shown by all male subjects, but not all female subjects. This preference was demonstrated by subjects choosing to engage in work performance only during the appropriate equity hours and terminating work in favor of other activities (e.g., reading, eating, resting) during alternate hours. In subsequent experiments when the choice interval was 24 hours [i.e., complete days designated either group (equality) or individual (equity)], the preference for equity was reduced and this effect of the duration of the work interval was replicated in a within subjects design which examined allocation preference for both one hour and 24 hour intervals in the same subjects.

Since the literature suggested that increased intersubject interaction tended to shift preferences from equity toward equality (Sagan, Pondel and

Wittig, 1981) the next experiments were designed to promote subject interaction by requiring subjects to work as a group (i.e., access to work tasks required all three subjects to work at the same time in the same room) on selected days of the experiments, while on other days individual work was permitted. With male subjects under these conditions, the strong preference for equity allocation was again replicated on "individual" days. However, in this experiment (unlike a previous group work experiment) when required to work together, male subjects became non-cooperative and forced the premature termination of the protocol. Female subjects, on the other hand, under the same experimental procedure not only worked successfully as a group, but demonstrated increased productivity under these group work conditions. Additionally, as previously found, preference for equity in female subjects was less than that of males and tended to be further reduced during group work conditions. Another significant finding which emerged from this study was that the imposed group work conditions resulted in increased group cohesiveness as manifested by increased socialization among group members. This finding of increased group socialization as a by-product of required group work was also demonstrated in the first study which required three male participants to work together. The most recent series of experiments, described below, focused upon the conditions under which individuals cooperate in group efforts for equal allocation of rewards, and examined the social by-products of such group organizational structures.

Current Research Findings

The previous research findings described above showed that individuals in the small group environment, although placed in close proximity and required to share in some of the available environmental resources, will

nonetheless tend to function independently and prefer an equitable allocation of rewards. This tendency toward isolation (i.e., minimal socialization and communication) is all the more striking when under some circumstances it resulted in prolonged work days and self-imposed limits on earnings. Therefore, the most recent series of experiments focused upon conditions which promote group organization, utilizing equal reward allocation, and the social effects of such group formation.

The first experiment in this series employed three male subjects (ages 26, 27, 31) for a 9-day residency in the environmental laboratory. The purposes of this experiment were 1) to determine the conditions under which male subjects, initially disposed toward working for equitable reward allocation will shift toward working in conjunction with others for equal reward allocation, and 2) to examine the social, communicative, and morale changes that accompany such shifts in organizational structure and associated reward allocation norms.

The experimental procedure involved subjects performing on two work tasks: the manual work task (MT) which was available in each subjects private chamber, and the Alluisi Performance Battery (AP) which was available only in the work room. Each subject was given equal access to the Alluisi task through specifically assigned hours of availability. Monies earned on these tasks were deposited in either of two bank accounts: an individual account or a group account. Subjects, prior to work episodes, indicated for which bank account they would be working. At the end of the experiment, subjects received all the money in their individual account plus 1/3 of the money in the group account (the other two subjects received the remaining 2/3). In this experiment reward allocation choice (i.e., individual or group) was not (as in previous experiments) designated

by work time, but rather was indicated for each work episode by the subject displaying a G (group) or I (individual) sign indicating which allocation norm he was selecting for that work period. Since previous research had indicated a strong preference for earning via the individual bank account, the purposes of this experiment was to determine the effects of incentives for shifting this preference to the group bank account. To this end, bonuses were offered for earnings contributed to the group bank account. These bonuses ranged from 10% (i.e., \$10 given for \$100 earned in the group bank account) to 60%. After an initial baseline day which confirmed all subjects complete (100%) preference for the individual (equitable) over group (equal) allocation, bonus incentives were added for the group allocation choice. In addition to individual versus group choices, the dependent measures taken included socialization (time spent in a social area), communication (time spent in diadic and triadic phone conversation) and morale (interpersonal ratings).

The results of this experiment are summarized in Figure 1 which shows the percentage distribution of earnings for individual (equity allocation) and group (equal allocation) accounts for each of the three male participants over the course of the nine day experiment. On day one, when there was no incentive bonus for group cooperation all subjects showed a complete (100%) preference for individual type of earnings, again replicating previous findings. This preference was maintained on day 2 despite the offering of a 25% bonus for choosing the group (equal allocation) mode. On day 3, the bonus was increased to 50% (i.e., \$50 given for \$100 earned via the group account) and at this bonus level, some shift toward the group choice is evident, although even at this relatively high bonus level, the dominant choice for equitable allocation still

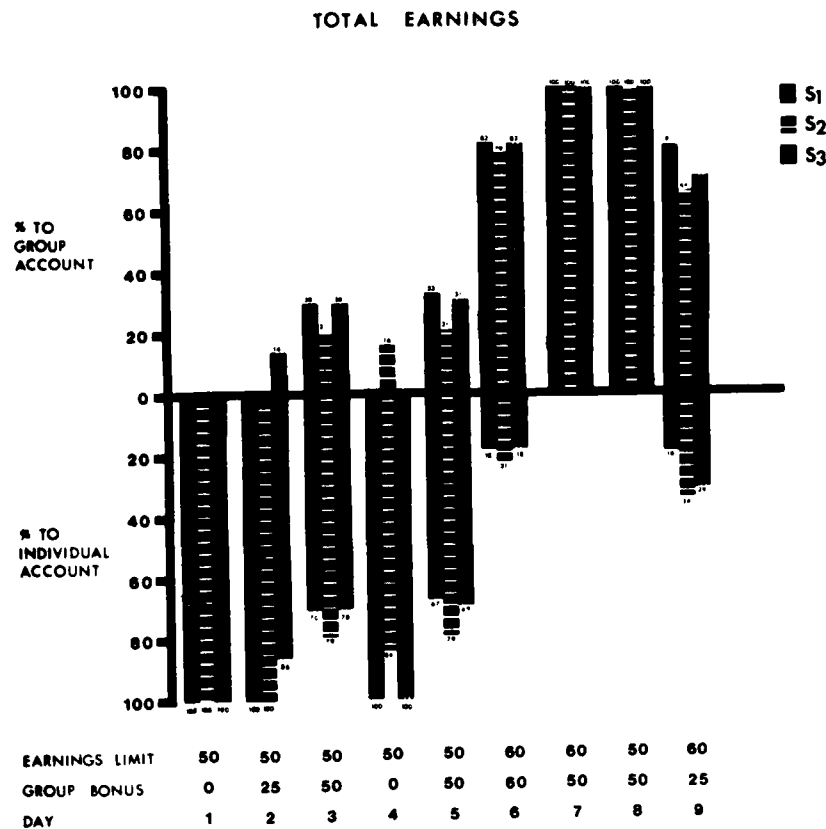


FIGURE 1

remains. On day 4, when baseline (0 bonus) conditions are reinstated, the complete preference for individual earnings is recovered, and similarly, on day 5 when the 50% bonus is reintroduced the partial shift observed at this bonus level on day three is also repeated. Indeed, the extent of this partial shift in preference is remarkably similar on these two days, reflecting the precise sensitivity of choice behaviors to this controlling variable. A major shift toward group cooperation and equal reward allocation occurs on day six when the incentive bonus is raised to 60% and the daily earning limit is increased from \$50 to \$60. This shift developed progressively, initially occurring in the more routine work episodes (i.e., manual task) for which contributions to the group account were more easily regulated and specified. Work involving the more complex behaviors (i.e., Alluisi Performance Battery) which showed greater intersubject performance

differences shifted to group participation 18-24 hours later. The slightly higher earnings limit (\$60 vs. \$50) on days 6, 7, and 9 is confounding and this necessitates interpretive caution, but subsequent research and analyses suggest this difference in earning limit is not responsible for these major effects. In any case, the important outcome under these conditions is that the three participants cooperated and worked for equal reward allocation and the cohesiveness of this group formation is indicated by the stability of the group in the face of subsequent reductions in both the daily earning limit and bonus incentives. Thus once established, the group tends to remain constituted despite a return to conditions which initially were insufficient to cause group formation.

The cohesiveness of this group is further indicated in Figure 2 which shows the use of the social area by the participants as individuals, or as dyads and triads. These data reveal that as group work modes developed, these cooperative work efforts were accompanied by increases in group

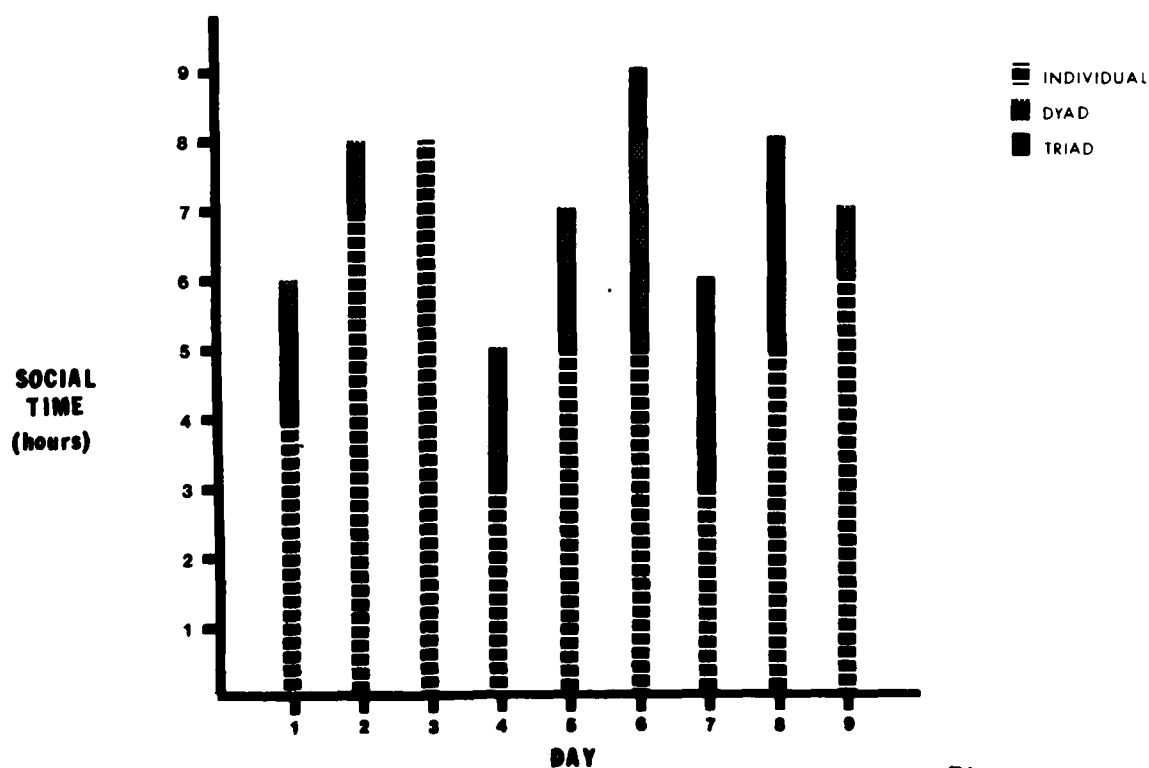


Figure 2

socialization, especially in triadic social episodes. These triadic episodes emerged on days 6, 7, and 8 when group cooperation and enuitable reward allocations were at high strength, whereas on days 1 and 4 when no incentive bonuses were offered, the use of the social facilities was minimal. This increase in socialization was not caused by programmatic properties of the work or living schedules, but rather was a "free choice" which emerged as a byproduct of the cooperative group formation. That this socialization process reflects the improved interpersonal feelings of the participants is also indicated by the data shown in Figure 3. Throughout the experiment, as part of the protocol each subject is asked to provide ratings (in the form of analogue scales) of the other two participants. These daily ratings are plotted in Figure 3 and show that on day 5, when the group formation occurred, there was a marked improvement in the ratings of the two subjects for which this subjective scale was sensitive (Subject 1 continually marked the extreme positive end of the scale throughout the experiment).

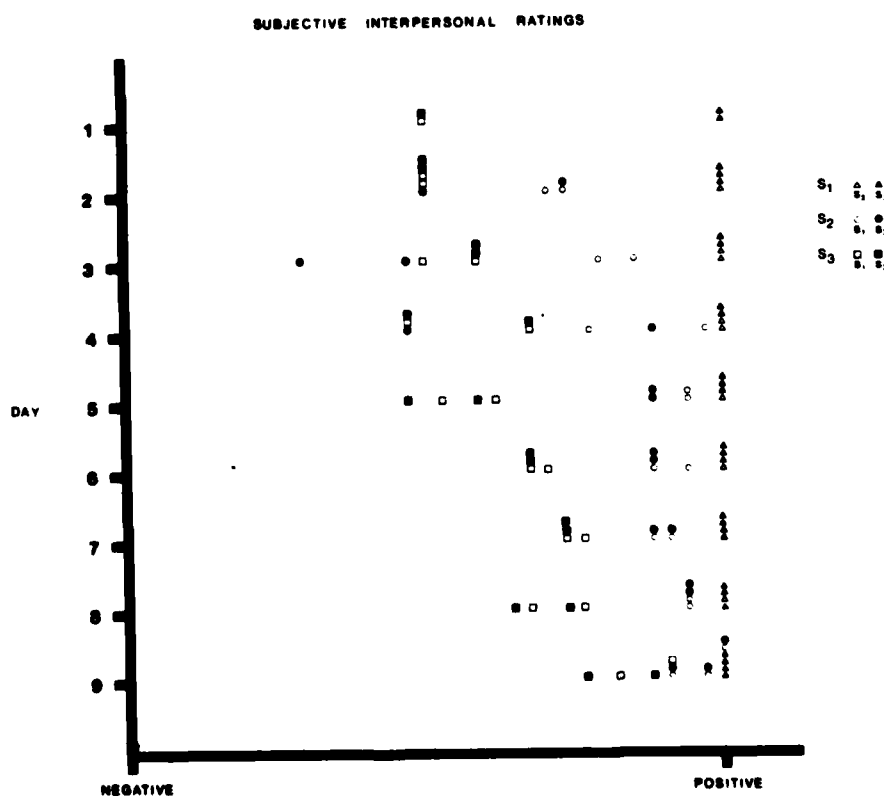


Figure 3

The fourth set of data consistent with the overall pattern of positive group formation is the record of communication, between the subjects over the course of the nine day experiment. These data are shown in Figure 4 and indicate that as the group formed, communication time increased, especially (as in the data of social episodes) in triadic communications.

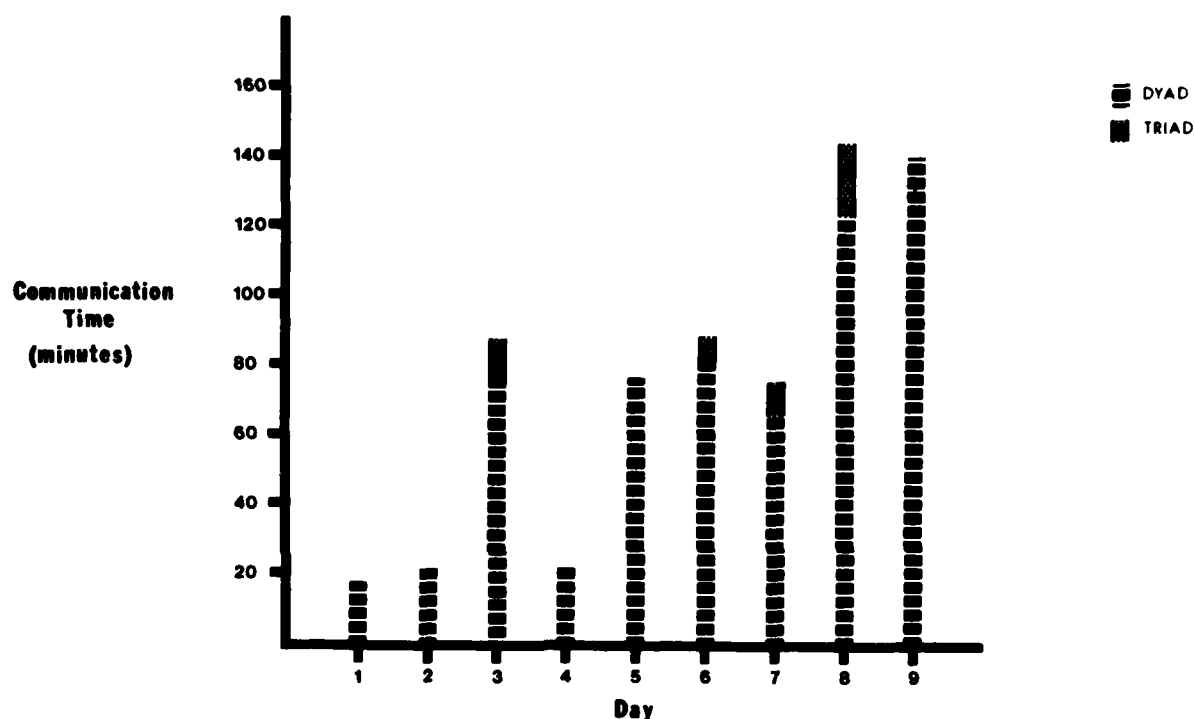


Figure 4

An additional feature of this experiment that is noteworthy pertains to the work performance abilities of the three participants. The group formation that transpired took place despite the fact that the three men were not equivalent with respect to their work performance abilities.

Figure 5 shows the performance curves of the three subjects on the Alluisi Performance Battery over the course of the experiment. Open data points show performance when group choices were made while solid data points represent work performance following choices for individual (equitable) earnings. These data indicate that the three subjects differed

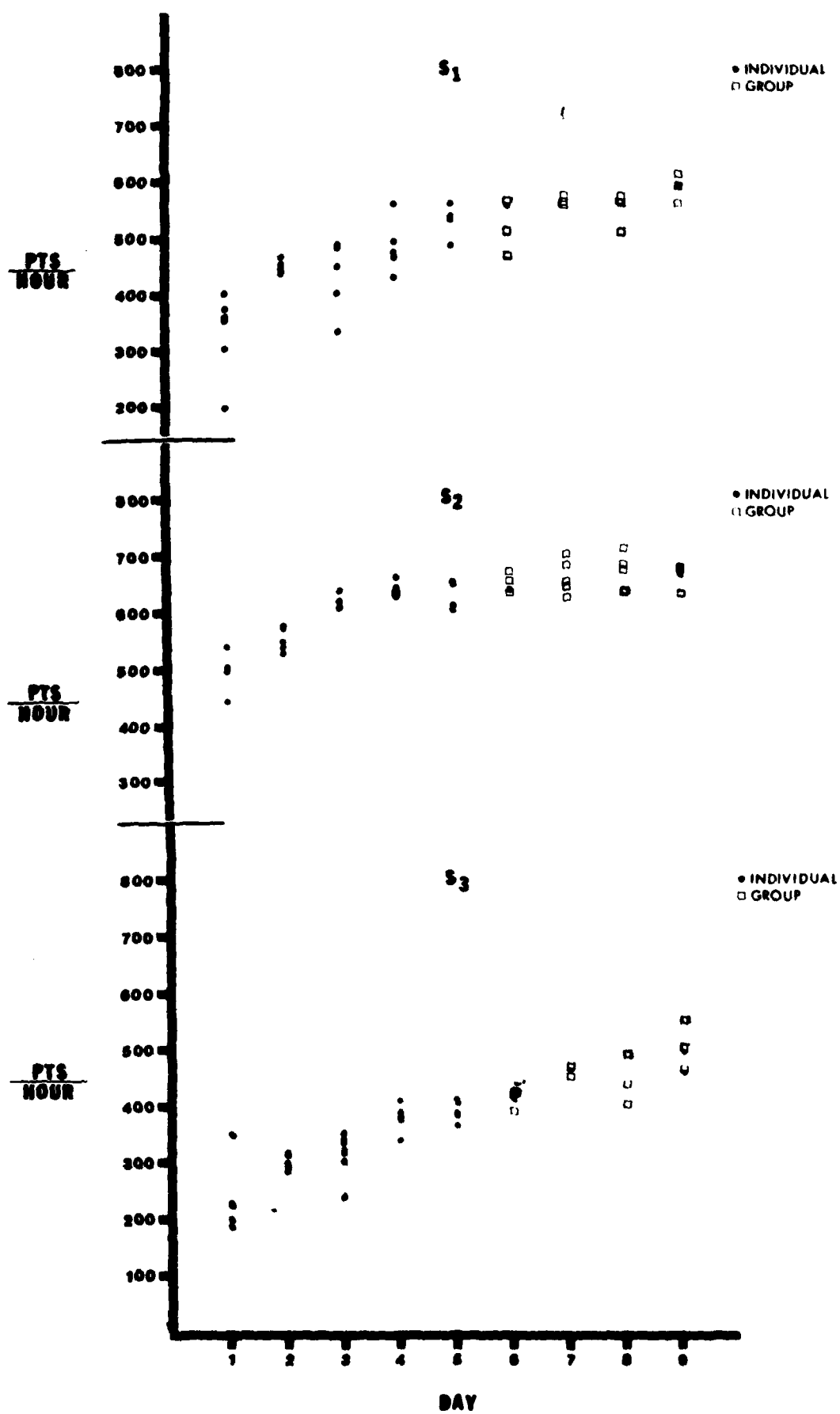


FIGURE 5

considerably in their abilities to earn points, with Subject 2 showing the best performance, both initially and terminally, averaging about 100-200 points higher than Subject 3 who was the poorest performer on this task. By the end of the experiment, the differences between subjects were reduced. Importantly, Figure 5 also shows that the shift toward equal reward allocation did not compromise the work performance of any of the participants. Indeed, for Subject 3, the shift to group cooperation was accompanied by an improvement of performance on day 6, 7, and 8 following a tendency toward asymptote at a lower level on days 4 and 5.

The next experiment in this series involved three female subjects (ages 25, 29, 35) and was similar in all respects to the experimental procedure described above for three male subjects. The women resided in the programmed environment for ten consecutive days during which they could earn money by working on either the manual task or Alluisi Performance Battery. Several times each day, prior to each work episode, participants indicated their choice of working for individual (equity) or group (equal) reward allocation. During the course of the experiment, incentive bonuses were offered for group allocation choices. The results of this experiment are shown in Figure 6. On day 1, when no bonus was offered all subjects selected to work for individual reward allocation. This choice persisted through day 2 despite a bonus offering of 25% for group (equal) reward allocation. On day three, however, when the bonus was increased to 50%, all three women shifted their choices to the group allocation. This is in contrast to the outcome with the three male subjects in the previous experiment who showed only a minimal shift toward the group allocation when this 50% bonus level was introduced. On days 4 and 5 with the 50% incentive bonus still in effect, complete (100%) preference for group

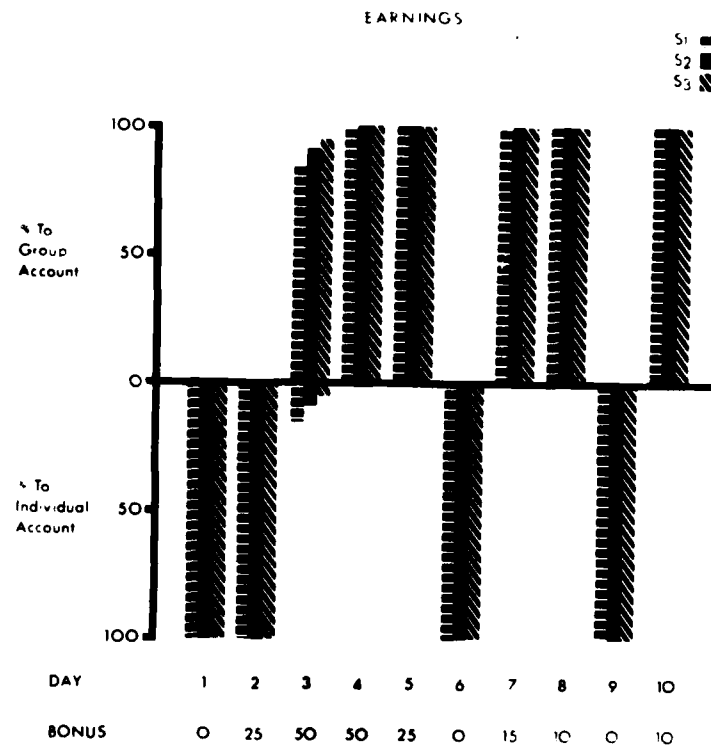
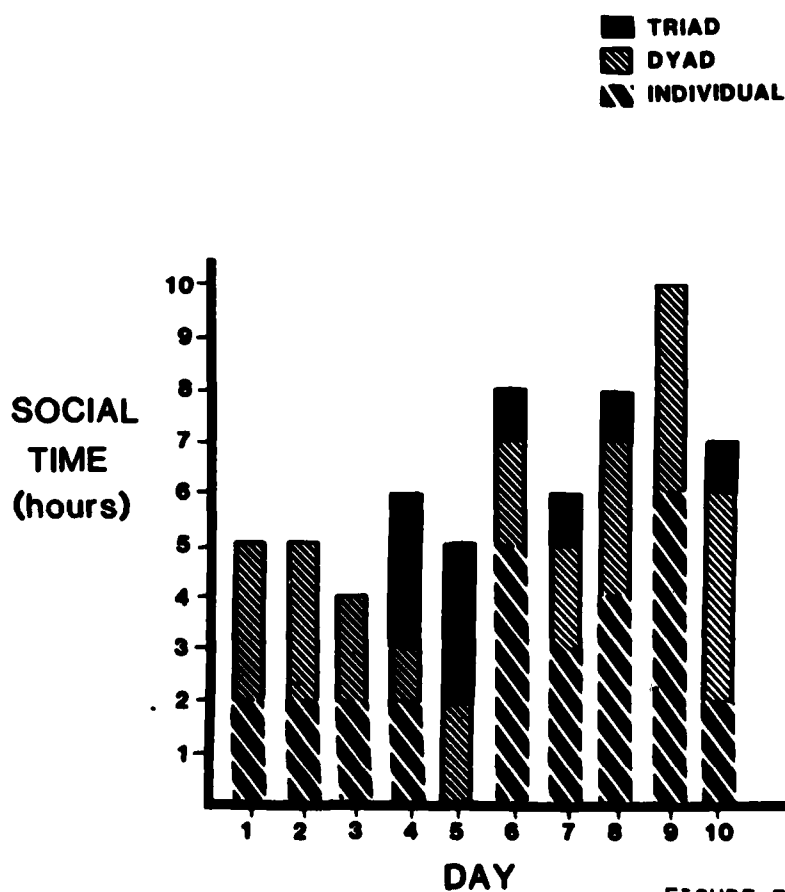


FIGURE 6

allocation was demonstrated in all participants. On day six, when the bonus was removed, all subjects reverted back to the equitable allocation choice, although the daily earning limit was increased from \$50 to \$60. On day 7, a 15% bonus was offered, and this was sufficient to reinstate a complete return to the group allocation norm. This choice for the group was maintained on day 7 when the bonus was further reduced to 10% and the daily earning limit reduced to \$50. On day 9, the removal of the bonus again reestablished the choice for the individual mode of earnings, and on day 10, the choice of group mode was again evident when the 10% incentive was made available. In summary, this experiment with three female participants confirmed the previous findings showing that: 1) cooperating groups based upon equal reward allocation could be established with bonus

incentives, 2) once established, groups tend to tolerate reductions in bonus levels initially insufficient to create group cooperation, and 3) the females tend to show sensitivity to incentives for group formation at lower levels than do the male subjects. Data on socialization and communication time are still under analysis, but preliminary examinations as illustrated in Figure 7 support earlier observations that there are concomitant increases in these measures as group formation takes place. This can be seen in Figure 7 as the clear increase in triadic socializations that occurred on days 4 and 5 when group cooperation in working for equal reward allocation was evident, and conversely in the absence of triadic socialization on day 9 when the individual (equitable) form of reward allocation was reinstated.



The next experiment in this series was designed to explore the interaction of bonus incentives for group formation with the temporal properties of the ongoing daily schedule of activities. In previous experiments, subjects were permitted to maintain a fairly high degree of individuality by being allowed to remain in various activities (e.g., work, reading, crafts) for indefinitely long periods of time. We hypothesized that this degree of flexibility might mitigate against group formation, and in order to examine this variable, the experimental procedure during the first and last three days of the next 10-day experiment restricted all activities to one-hour duration. The middle four days of this ABA design were the same as in previous experiments, with no restriction on the duration of activities. The subjects were three males ages 19, 27, 32.

As in previous experiments, bonus incentives were offered for choices of group reward allocation on selected days throughout the experiment. The results of this experiment, shown in Figure 8, indicated that under the

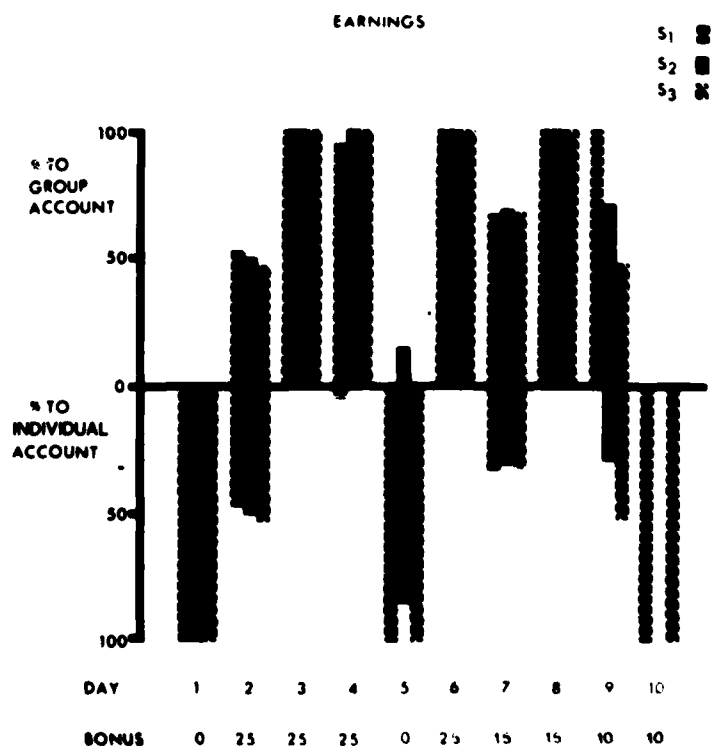


FIGURE 8

hourly activity sequence (days 1, 2, 3) the male subjects responded to a 25% group bonus (lower than in previous experiments) by shifting progressively to a complete group reward allocation. The group formation persisted during the alternate activity schedule during days 4 and 6, but on day 7 when the bonus was reduced to 15%, a partial reversal to individual earnings was evident. However, a complete return to the group reward allocation under the 15% bonus condition was achieved when the hourly activity sequence was reinstated on day 8. A subsequent bonus reduction to 10% on days 9 and 10 resulted in a return to the equitable form of reward allocation.

These results corroborate the earlier findings showing both the sensitivity of group formation to these incentive conditions and the cohesiveness of groups once constituted. Further, these findings suggest an interaction between the temporal properties of ongoing activity sequences and the responsiveness of group formation to the potentiating effects of bonus incentives.

Whereas the experiments thus far described focused upon the use of incentives for triadic cooperation, the most recent experiment conducted investigated the effects of incentives for equal reward allocation under conditions where both dyadic and triadic cooperation were permitted. Under these conditions, bonuses were offered whenever participants (either as dyads or triads) elected to both work at the same time and share equally in accumulated earnings.

This experimental design was intended to examine: 1) the dispositions of participants to "share" as dyads versus triads, 2) the effects of bonuses upon such sharing episodes, and 3) the requirement that "sharing"

involve both equal reward allocation and synchronization of shared-work activities. In addition, as in the previous experiment, on certain experimental days (i.e., days 4-7), an hourly activity sequence was in effect. The subjects in this experiment were three males ages 26, 28, 33. The results of this experiment as shown in Figure 9 suggest the following conclusions:

1) With no incentives, all subjects choose to work individually for equitable reward allocation.

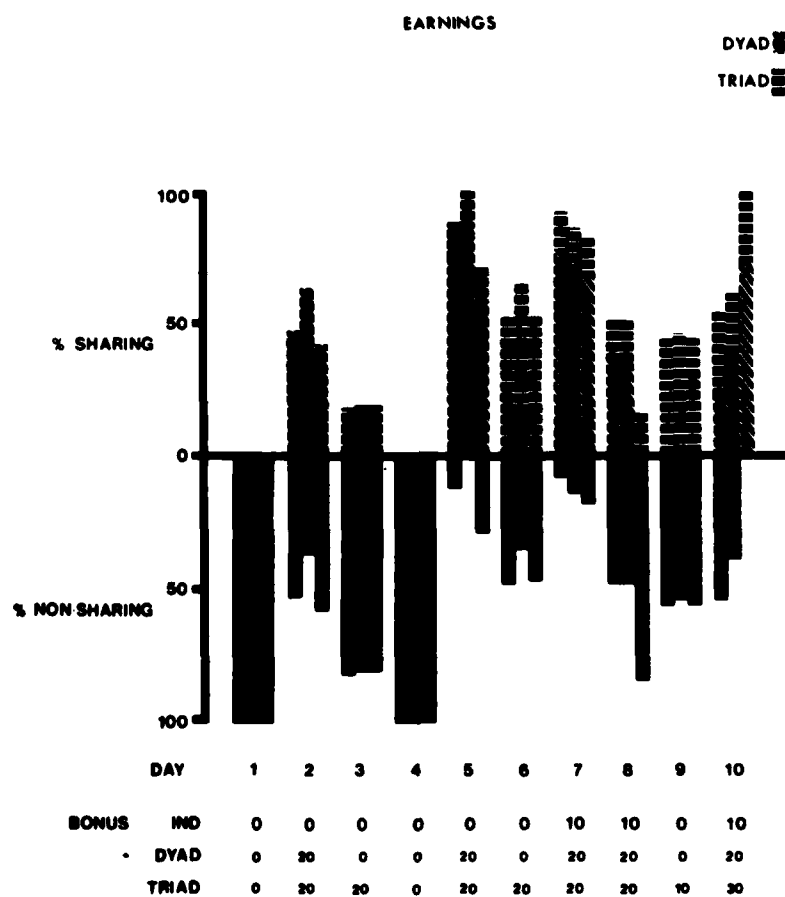


FIGURE 9

2) When provided with incentives for sharing in equal allocation, subjects will choose this alternative by cooperating to meet the requirement for synchronized work activities.

3) Either dyadic or triadic sharing episodes can be differentially established through the appropriate employment of bonus incentives.

4) When incentives for dyadic and triadic sharing are equal, subjects select dyadic work episodes much more often than triadic work episodes.

5) Under equivalent bonus conditions, sharing episodes are more prevalent when a one-hour activity schedule is in effect.

The experimental procedures thus far described were utilized to examine group vs individual organizational structures based upon the participants' choice of pooling or segregating earned incomes. All work forms, however, remained based upon individual performance. The next experiment in this series was designed to investigate these organizational forms when a group selection required three person cooperation on a team task adaptation of the computerized Alluisi performance battery.

The team performance task involved three operators because the dials task component of the Alluisi battery required coordinated inputs for registering the presence of a dial bias. That is, once a bias has been detected on a dial, the corresponding keyboard key had to be pressed by all three operators within a 1-second interval of each other. For example, if there were a bias on dial #1, a correct response would occur if 2 operators pressed their D1 keys within 1 second after the first operator had pressed his D1 key. In contrast, if one operator waited more than 1 second to press his key after another operator had pressed his key, the bias would

not be eliminated. It was up to the team members to determine a method of coordinating their responses on the team task. The remaining tasks in the battery remained individual, and did not require coordinated team responses for these solutions.

At the conclusion of a team work episode, each subject received an earnings amount equal to the team total regardless of individual contributions to the total amount. All subjects filled out a work report after each work episode (see Appendix A). In addition to the team form of the Alluisi performance battery, subjects could also choose to work individually on the Alluisi task or individually on the lever pulling task in their private living quarters. On day 1, subjects were required to sample both individual and team modes of work performance. Subsequently, subjects could make this choice freely and without restriction. On selected days, monetary bonus incentives were in effect in order to favor specific work mode selections. The subjects were three females ages 18, 20, and 23.

On day 2, when subjects could choose either team or individual work modes, subjects 1, 2, and 3 earned 8%, 9% and 9% of their total earnings respectively by working on the team task. There was no bonus incentive for the team task on day 2. On day 3, a 25% bonus was in effect for monies earned on the team task. The effect of this incentive was to triple the percentage of earnings via the team task to 26%, 27%, and 25% for subjects 1, 2, and 3 respectively. On day 4 the bonus for team task work was removed with the consequent result that there was no team task selection on day 4. On day 5 a major malfunction of the computer controlling this experiment forced its premature termination. Nonetheless the results of this experiment both confirmed and extended the previous findings of this

thematic research program. Specifically, the transition to group (team) structure can be achieved through incentive "seeding" operations when this group mode involves both equal sharing of rewards, as well as cooperation between participants for the effective execution of a team task. Further, analysis of component problems of the team performance on the Alluisi battery revealed the systematic use of specialized assignments for each participant to the various components of the Alluisi battery. Work report surveys revealed that this distribution of assignments occurred through mutual tripartite agreement and without the internal recognition of any individual as the team leader.

A paper describing the results of these experiments was presented at the April 1982, meeting of the Eastern Psychological Association in Baltimore, Maryland.

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ALLUISI TASK
WORK REPORT

APPENDIX A

Subject Name _____ Check
Task Name: AP-G _____ AP-I _____

Points earned _____

Starting time _____ Time spent working
(in hours and minutes,
Stopping time _____ and excluding "break" time) _____

1. How did you apportion your time among the five tasks? Dials _____ %
Math _____ %
X _____ %
G, R _____ %
Histogram _____ %
TOTAL 100 %

2. Please rank the five tasks on a five-point scale with 5 being the hardest or least enjoyable and 1 being the easiest or most enjoyable:

Dials _____
Math _____
X _____
G, R _____
Histogram _____

- If AP-G: 3. Which (if any) of you seemed to play a leadership role during work on the team tasks? Please circle below:

Subject 1 _____ Subject 2 _____ Subject 3 _____

- If AP-G: 4. Please rank the subjects according to which subject correctly identified the most dials, with 1 being the most, 2 next and 3 least:

Subject 1 _____ Subject 2 _____ Subject 3 _____

5. Please describe any strategies you used for solving any of the component problems of the computerized Alluisi Performance battery:

6. Did you notice any technical malfunctions in the presentation of tasks, keyboard operation, or point scoring systems of the computer tasks? If so, please describe:

7. Please describe your feelings while working on the computer tasks: